

SUB-ASSEMBLY MOUNTING SYSTEM

BACKGROUND OF THE INVENTION

[0001] 1. Technical Field:

[0002] The present invention relates to a mounting arrangement for a sub-assembly on a vehicle and more particularly to a mounting arrangement and method for modular components and sub-assemblies such as fuel tank modules across a vehicle frame.

[0003] 2. Description of the Problem:

[0004] Trucks are built on frames which serve as foundations for the vehicle's body and as a platform on or to which various components may be mounted or attached. A typical full perimeter frame includes, among other components, two longitudinally extending frame rails. The rails are commonly connected to one another by several latitudinal cross members. The cross members provide lateral and torsional rigidity to the frame assembly. One cross member will typically be positioned to support a truck cab. Components, such as fuel and hydraulic tanks, may be mounted across the frame rails perpendicular to the direction of elongation of the vehicle.

[0005] Back of cab fuel tank modules are known which are supported across the frame rails as illustrated in Fig. 3. In this design, mounting brackets descend from the bottom of the tank module, which allows for attachment to mounting points on the frame rails. The mounting brackets provide good side-to-side alignment, but do not provide fore/aft positioning or good vertical positioning to allow the introduction of fasteners.

[0006] Assembly of vehicles would be eased if fuel tank modules were automatically aligned with the correct position on the vehicle chassis for attachment to the chassis as the fuel tank modules were positioned on the vehicle.

SUMMARY OF THE INVENTION

[0007] The present invention provides a vehicle chassis with a modular sub-assembly such as a tank for fuel or hydraulic fluid. The vehicle chassis has first and second longitudinally aligned frame

rails. Each frame rail has an outwardly oriented side. First and second rail side brackets are mounted to the outwardly oriented sides of the first and second frame rails, respectively. Each rail side bracket has a pair of outward extending, parallel guide or alignment arms. The module is supported latitudinally across the frame rails from an elongated carrier forming the bottom of the module. The elongated carrier is supported from below on back edges of the first and second rail side brackets. Four mounting tabs descend from the elongated carrier, extending downwardly from the module. Each mounting tab has a one to one correspondence with a different, alignment arm. The four mounting tabs are spaced to straddle the frame rails to the outside and to bracket the alignment arms as the module is lowered onto the chassis. To effect this cooperation the mounting tabs have alignment edges along one side facing the outside face of the frame rail and leading cam sections along the bottom portion of the mounting tab. The alignment edges urge the module into the correct side-to-side position working against the frame rails and the cam sections urge the module into the correct fore/aft position working against the alignment arms. The module is vertically positioned by the support provided the module from the back edges of the rail side brackets. Fastening points are provided through the guide/alignment arms and mounting tabs.

[0008] Additional effects, features and advantages will be apparent in the written description that follows.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] The novel features believed characteristic of the invention are set forth in the appended claims. The invention itself however, as well as a preferred mode of use, further objects and advantages thereof, will best be understood by reference to the following detailed description of an illustrative embodiment when read in conjunction with the accompanying drawings, wherein:

[0010] Fig. 1 is a perspective view of a vehicle chassis.

[0011] Fig. 2 is a partial view of a pair of frame rails from the vehicle chassis of Fig. 1.

[0012] Fig. 3 is a partially exploded view of a prior art fuel tank module and chassis combination.

[0013] Fig. 4 is a partially exploded view of a modular fuel tank sub-assembly and chassis combination in accordance with one embodiment of the present invention.

[0014] Fig. 5 is a front elevation of the modular fuel tank sub-assembly as positioned on the parallel frame rails of the chassis.

[0015] Fig. 6 is a side elevation of the modular fuel tank sub-assembly.

[0016] Fig. 7 is a perspective view of the modular fuel tank sub-assembly.

[0017] Fig. 8 is a perspective view of the modular fuel tank sub-assembly attached to a vehicle chassis.

DETAILED DESCRIPTION OF THE INVENTION

[0018] Referring now to the figures and in particular to Fig. 1, a perspective view of a vehicle chassis 10 is illustrated. The foundational component of chassis 10 is a box frame 12. Frame 12 provides connection points for suspension elements for numerous vehicle components, including by way of example, rear axle 18 and front axle 19. Rear wheels 20 and front wheels 22, are mounted on axles 18 and 19, respectively. Frame 12 carries an engine 14 and dash panel 16 and provides a base for the construction of a body (not shown) and a place to position the modular tank of the present invention.

[0019] Fig. 2 illustrates that box frame 12 is constructed in part from two elongated frame rails 24 and 26, each of which run substantially the length of a vehicle and which lie parallel to one another. Frame rails 24 and 26 are held parallel to one another by a series of cross members, here arranged perpendicularly to the frame rails, although other orientations for cross members are possible. Among the cross members is an intermediately positioned, cab support cross member 30. The cab support cross member 30 supports a driver and passenger cab positioned on frame 12.

[0020] Frame rails 24 and 26 have top and bottom flanges 47 and 45, respectively (visible on frame rail 26). Flanges 47 and 45 of both rails 24 and 26 extend inwardly toward the centerline of the frame 12, as illustrated by the flanges from frame rail 26. Flanges 45 and 47 give frame rails 24 and 26 their characteristic C cross sectional shape with flange 45 providing an upper surface. Numerous holes 39 pass through frame rails 24 and 26 to provide support points for the insertion mounting components such as bolts. Nut and bolt combinations 50 are illustrated in association with cross member 30,

providing connection of mounting hardware for the cross member to frame rail 24.

[0021] Referring to **Fig. 3** a prior art method of installing a fuel tank module 40 on a pair of frame rails 24, 26 is illustrated. Fuel tank module 40 comprises a fuel tank 42 set in an elongated carrier 44 which may be constructed of support rails 60 and end plates 62 to form a rectangular cradle to receive the bottom portion of the fuel tank. Carrier 44 supports fuel tank 42 from underneath and provides a frame which may be rested across frame rails 24 and 26. The fuel tank is held in carrier 44 by straps 61 which are wrapped across the top of the tank from each side. Extending downwardly from carrier 44 are two mutually spaced mounting brackets 64 and 66. Mounting brackets 64, 66 are spaced to fit around the relative outside faces of frame rails 24 and 26. The outside faces (including outside face 25 for frame rail 24) are flat faces oriented facing away from the longitudinal centerline of chassis 10. Right side mounting bracket 66 includes a bottom edge 68 which is turned outwardly relative to frame rail 26 at the bottom of the bracket to allow some initial side to side play in fit as fuel tank module 40 is lowered onto a vehicle chassis. The minimum spacing between brackets 64 and 66 is however set to much closer tolerances to provide a snug fit for the brackets around frame rails 24 and 26. This provides good side to side positioning of the fuel tank module 40, however, it leaves it to the production workers on the line to adjust the front to back and vertical position of the fuel tank module to bring attachment points 41 on the mounting brackets into alignment with attachment points 39 in frame rails 24 and 26.

[0022] Referring now to **Fig. 4**, a partially exploded view of a vehicle chassis and fuel tank assembly is illustrated with a sub-assembly, here a fuel tank module 70, shown above its mounting position across vehicle frame rails 24 and 26. In the present invention, as distinguished from the prior art described with reference to **Fig. 3**, the mounting hardware is divided between portions installed on frame rails 24 and 26 prior to mounting of the fuel tank module 70, namely side rail brackets 80 and 82, and those components descending from the fuel tank module, namely four mounting tabs 71, 72, 73 and 74 (with mounting tabs 73, 74 shown in **Fig. 7**). Side rail brackets 80 and 82 are C-channel shaped metal components, attached along back sections 97 and 99, respectively, to the outer faces of frame rails 24 and 26. Conventional fasteners, such as nuts and bolts, may be used to mount side rail brackets 80, 82 from the outer faces of frame rail 24 and 26, with the bolts positioned through mounting hole attachment points 39 in the frame rails and openings through the back sections 97, 99 of the side rail brackets. Side rail brackets 80 and 82 each include two outwardly oriented arms or guide arms, including guide arms 86 and 88 from side rail bracket 80 and guide arms 87 and 89 from side rail bracket 82. Attachment of fuel tank module 70 to frame rails 24, 26 is effected by attachment of the

four mounting tabs **71-74** to the guide arms of the two side rail brackets **80, 82**.

[0023] Rail side brackets **80, 82** cooperate with mounting tabs **71-74** to provide front to back positioning of fuel tank module **70**. Rail side brackets **80, 82** further provide a support for elongated carrier **44** to position fuel tank module **70** vertically. Rail side brackets **80** and **82** are located on frame rails **24** and **26** to leave the topmost portions of back sections **97** and **99** extending above the upper faces of frame rails. This arrangement positions support edges **81** and **83** to support elongated carrier **44** from its bottom surface, or the bottom surface of its exterior rails **60**. Guide arms **86-89** are truncated right triangular shaped projections, with one base providing juncture with the respective back sections of the rail side brackets **80, 82**. Attachment points **139** are provided through each of the guide arms **86-89** and attachment points **239** are provided through mounting tabs **71-74**. A step **101** is illustrated extending past one end **62** of elongated carrier **60**.

[0024] Mounting tabs **71-74** cooperate with frame rails **24, 26** to locate fuel tank module **70** from side to side over the frame rails. Referring to Fig. 5 mounting tabs **71** and **72** may be seen to descend from side rail **60** of elongated carrier **44**, extending downwardly from the carrier (in its usual orientation) to the relative outside of chassis **10** as defined by frame rails **24** and **26**. Mounting tabs **73** and **74**, which do not appear in this figure operate in the same fashion and the discussion relating to tabs **71** and **72** is equally applicable to them. Side rail brackets **80, 82** are deleted from Fig. 5 to better illustrate the interaction of mounting tabs **71** and **72** with frame rails **24** and **26**. The relative interior edges **171** and **172** of mounting tabs **71** and **72**, respectively, are angled away from the outer faces **27** and **25** from top to bottom. Interior edges **171** and **172** function as cams against the upper edges of outer faces **27** and **25** to urge fuel tank assembly **70** toward a centered position over frame rails **26** and **24** as the fuel tank assembly is lowered onto the rails, even if the fuel tank assembly is initially somewhat misaligned relative to the chassis.

[0025] Referring to Figs. 6 and 7, the operation of mounting tabs **71-74** cooperating with guide arms **86-89** to effect correct positioning of the fuel tank assembly from front to back along chassis **10** is illustrated. Frame rails **24** and **26** are deleted from the drawings for clarity of illustration. Each of mounting tabs **71-74** corresponds with one of guide arms **86-89**. The correspondences are as follows: mounting tab **71** with guide arm **87**; mounting tab **72** with guide arm **86**; mounting tab **74** with guide arm **88**; and mounting tab **73** with guide arm **89**. When fuel tank assembly **70** is fully lowered onto frame rails **24** and **26**, front to back pairs of mounting tabs snugly bracket to the outside front to back pairs of guide arms. A front to back pair of guide arms are the guide arms extending from a particular side rail

bracket. Front to back pair of mounting tabs **71, 73** corresponds to the guide arms of side rail bracket **82** and front to back pair of mounting tabs **72, 74** corresponds to the guide arms of side rail bracket **80**.

[0026] The lower edges of mounting tabs **71-74** turn outwardly from the corresponding guide arms for each mounting tab, thereby providing lower cam sections **171-174**. When fuel tank module **70** is lowered onto rail side brackets **80** and **82**, alignment need not be initially perfect. Any of cam sections **171-174** may impinge against its corresponding guide arm, resulting in the fuel tank module **70** being urged forward or backward into alignment on the guide arms, assuring alignment of the attachment points on the mounting tabs with attachment points on the guide arms. Alignment of mounting tabs **71-74** with guide arms **86-89** may be assured by fixing the side rail brackets **80** and **82** when attaching them to frame rails **24, 26**.

[0027] Referring to **Fig. 8**, the completed assembly of fuel tank module **70** on frame rails **24** and **26** is illustrated. Fasteners **139** are installed to attach side rail brackets **80** and **82** to frame rails **24** and **26** and to attach mounting tabs **71** and **72** to side rail brackets **80** and **82**. Fasteners **139** are typically nut and bolt combinations, with the bolts being oriented through the guide arms and mounting tabs so that nuts are attached to the relative outside of the assembly, i.e. from in front of and behind fuel tank module **70**.

[0028] Installation of the fuel tank module **70** on frame rails **24** and **26** involves first installing side rail brackets **80, 82** on the frame rails. The sub-assembly of the fuel tank module **70** is then lowered onto the frame rails, oriented with the mounting tabs **71-74** downwardly oriented and approximately over their corresponding guide arms. Assuming fuel tank module **70** is not perfectly aligned, as fuel tank module **70** is lowered one or more of the mounting tabs encounters either one of the guide arms **86-89** along a cam section or one of the frame rails **24, 26** against an alignment edge. Contact urges fuel tank module **70** either to the left or right and either forward or backward to fix the fuel tank module's position. As fuel tank module **70** becomes fully lowered, its carrier **44** comes to a rest on support edges **97** and **99**, supporting the vertical position of the module. The invention allows assembly of the fuel tank module on the vehicle chassis with a minimum of direct labor input devoted to alignment.

[0029] While the invention is shown in only one of its forms, it is not thus limited but is susceptible to various changes and modifications without departing from the spirit and scope of the invention.